



Saskatchewan
Environment

Hydrology Branch

Water Management Activities East Poplar River Basin 1981

December, 1983
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WATER MANAGEMENT ACTIVITIES

EAST POPLAR RIVER BASIN

1981

Report No. HYD-2-9

Prepared by:

Operations Division
Hydrology Branch

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SYNOPSIS

This report summarizes the activities of the Water Management Service (WMS) in the East Poplar River Basin in 1981. This format replaces a series of bi-monthly reports prepared by the various WMS Divisions which was initiated in 1978.

The Ground Water Division monitored water quality aspects of the ground water monitoring program in the basin and provided advice to other department branches on request. The Surface Water Division moved closer to licensing Cookson Reservoir under The Water Rights Act and identified non-contributing drainage areas in the basin.

The Hydrology Branch forecast spring runoff flows in the East Poplar River Basin in 1981 and since the runoff was well below normal Cookson Reservoir did not fill and no operations were required during spring runoff.

All of the base flow and demand releases specified in the interim apportionment formula proposed by the 1976 Poplar River Task Force were met in 1981.

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CHAPTER I

INTRODUCTION

The East Poplar River basin is situated in southern Saskatchewan about 150 km south of Moose Jaw. The East Poplar River has its headwaters in Saskatchewan and flows south into the State of Montana where it joins the Middle and West forks of the Poplar River. The drainage area in Canada is 1400 km². A plan showing the East Poplar River Basin in Saskatchewan is shown on Figure 1.

In the 1970s Saskatchewan Power Corporation (SPC) began work on a thermal electric generating station, a lignite mine and a cooling water reservoir in the East Poplar River Basin near Coronach, Saskatchewan. One 300 megawatt thermal generating unit was brought on line, with the second 300 megawatt unit scheduled for completion in 1983.

The Water Management Service of Saskatchewan Environment has been monitoring various aspects of these developments. The dewatering programs for the coal beds and monitoring of ground water levels and quality in the coal bed area, ash lagoon area and near Cookson Reservoir are of prime interest for the Ground Water Division of the Water Rights Branch. The Surface Water Division of the Water Rights Branch licences surface water development projects such as Cookson Reservoir. The Operations Division of the Hydrology Branch

provides a water supply forecasting service for Cookson Reservoir, advises SPC on reservoir operations and ensures that releases are made to meet apportionment commitments to the State of Montana.

The Environmental Protection Service of Saskatchewan Environment monitors water and air quality in the area and participated in the development of air and water quality standards as specified by the Poplar River Bilateral Monitoring Committee of the International Joint Commission (IJC).

CHAPTER II

WATER RIGHTS BRANCH ACTIVITIES

A. GROUND WATER

The Ground Water Division provided technical advice on an ongoing basis to the provincial representative on The Poplar River Bilateral Monitoring Committee in 1981 on water quality and quantity aspects of the ground water monitoring program in The East Poplar River Basin. Technical advice was also given to The Environmental Protection Service concerning SPC's dewatering wells.

B. SURFACE WATER

The major project in the East Poplar River basin from a surface water point of view is Cookson Reservoir. The licencing process for this project began in 1972. In 1980 a request was sent to SPC for information on land control for temporary surcharging, topographical information and copies of agreements with the Rural Municipality involved, Saskatchewan Highways and the CPR. SPC provided all required information with the exception of agreements with CPR and Saskatchewan Highways, which are awaiting clearance through CPR's legal department.

The non-contributing areas of The East Poplar River Basin were identified as recommended in the Basin Study and The Surface Water Division has advised developing agencies that applications will be considered for these areas on a project by project basis.

A backflood irrigation project is proceeding through the licensing process. This project will not result in a net usage of water since the consumption use will be less than evaporation losses would have been prior to the project's development.

A domestic project was applied for and subsequently authorized and licensed in the East Poplar River Basin.

CHAPTER III

HYDROLOGY BRANCH ACTIVITIES

A. GENERAL

Cookson Reservoir is owned and operated by SPC. The Hydrology Branch provides a forecasting and operation planning service to SPC and advises SPC on reservoir operations. The Hydrology Branch also administers the interim apportionment arrangement with the U.S. to ensure that base flows and demand releases are achieved.

B. WATER SUPPLY FORECASTING

Water supply forecasts are prepared each year prior to the spring runoff to aid in the operation planning for Cookson Reservoir. These forecasts are based on three precipitation periods recorded at Coronach: the previous August to October (Antecedent), November to February (Winter) and March. The recorded precipitation in the basin from August 1980 to December 1981 is shown in Table 1.

Snow surveys are conducted each year and the results of the 1981 measurements are shown in Table 2. The locations of the snow courses are shown on Figure 1.

Table 1

PRECIPITATION IN THE EAST POPLAR RIVER BASIN
1980 - 1981

	Coronach	West Poplar*	
	Recorded (mm)	Recorded (mm)	Normal (mm)
August 1980	80.0	29.1	32.3
September 1980	33.0	38.0	27.7
October 1980	19.0	18.4	13.4
November 1980	17.0	13.7	11.2
December 1980	11.0	36.5	12.2
January 1981	9.0	6.1	18.5
February 1981	16.0	8.6	11.5
March 1981	12.0	6.2	9.7
April 1981	7.0	5.0	22.7
May 1981	34.0	61.6	48.8
June 1981	78.0	74.3	65.7
July 1981	91.8	84.2	46.5
August 1981	51.0	19.4	32.3
September 1981	8.0	19.6	27.7
October 1981	37.0	21.4	13.4
November 1981	27.0	14.6	11.2
December 1981	25.5	13.2	12.2
1981 Totals	396.3	334.2	320.2

*For comparison purposes.

Table 2

1981 SNOW SURVEY RESULTS
EAST POPLAR RIVER BASIN

	March 1		March 15	
	Snow Depth (cm)	Water Equiv. (mm)	Snow Depth (cm)	Water Equiv. (mm)
Coronach N.	0	0	0	0
Coronach S.	0	0	0	0
Fife Lake	0	0	0	0
Willow Bunch	0	0	0	0

The snow survey results were considered, along with the results of regression equations based on precipitation, in preparing water supply forecasts for 1981.

C. 1981 STREAMFLOW AND WATER SUPPLY

Cookson Reservoir was at elevation 752.03 m on January 1, 1981 and had receded to 751.90 m by February 11. In mid-February most of the snow was melted and runoff occurred in the East Poplar River basin. The East Poplar River above Cookson Reservoir peaked at $3 \text{ m}^3/\text{s}$ on February 16 then quickly receded. Girard Creek near Coronach peaked at $1.31 \text{ m}^3/\text{s}$ on February 20 but soon receded to the base flow of about $0.12 \text{ m}^3/\text{s}$. The Cookson Reservoir elevation rose as a result of inflow and by February 25 had reached 752.46 m. The level rose more slowly to reach its maximum elevation for the year of 752.53 m on March 31. This is 0.47 m below the full supply level of 753.0 m.

No major releases were made from Cookson Reservoir during the runoff period and hence the maximum annual peak mean daily flow in the East Polar River at the International boundary was $0.34 \text{ m}^3/\text{s}$ on April 29.

Following the runoff, Cookson Reservoir receded to an elevation of 751.89 m by December 31, 1981. Figure 2 shows the East Poplar River, Girard Creek and Cookson Reservoir hydrographs for 1981.

The annual runoff volumes for the East Poplar River above Cookson Reservoir, Girard Creek near Coronach and East Poplar River at International boundary hydrometric stations are shown in Table 3.

Table 3
1981 SUMMARY OF STREAMFLOW VOLUMES

Station	Annual Volume (dam ³)
East Poplar River above Cookson Reservoir	623
Girard Creek near Coronach	3 160
East Poplar River at International Boundary	3 150

The change in storage on Cookson Reservoir from January 1 to December 31, 1981, was 992 dam³, a net loss for the year.

D. 1981 COOKSON RESERVOIR OPERATIONS

All structure operations during 1981 at Cookson Reservoir were made to meet Saskatchewan's commitment to the proposed apportionment formula (for details see Chapter IV). The required minimum flow in the East Poplar River at the International Boundary of 0.028 m³/s was met by ground water discharge and local runoff between Morrison Dam and the International Boundary. Operations were made to fulfill the demand release commitment of 617 dam³ (April 24 to May 21) carried over from 1980 and the 1981 demand release of 370 dam³ (June 1 to June 15). Details of the structure operations performed to meet these requirements are summarized in Table 4.

Table 4

OPERATIONS OF COOKSON RESERVOIR IN 1981

Period of Operation	Operation Comments
January 1 to April 24	25 cm by pass valve closed. Flow at International Boundary from leakage only.
April 24 to May 21	25 cm by pass valve opened to increase flows to satisfy water demand.
May 21 to June 1	25 cm by pass valve closed.
June 1 - 15	25 cm by pass valve opened.
June 15 to December 31	25 cm by pass valve closed.

CHAPTER IV

APPORTIONMENT

The Poplar River Task Force^{1/} in its 1976 Joint Studies Report for Flow Apportionment for the Poplar River Basin in Saskatchewan and Montana proposed the apportionment formula described in Appendix I. It called for, among other things, equal sharing of the waters of the Poplar River basin, subject to certain allowable variations on specified streams, and to specific delivery schedules.

The Task Force also recommended that the IJC appoint a Poplar River Board of Control, with members selected from the public service of the Governments of Canada, the United States, Montana and Saskatchewan to administer the apportionment under the IJC's direction.

The Poplar River Board of Control has not been formed, however the interim apportionment proposals have been adopted pending final resolution of the apportionment question.

^{1/} The Poplar River Task Force was formed by the Souris-Red Rivers Engineering Board following a request by the International Joint Commission for a proposal for flow apportionment in the Poplar River basin.

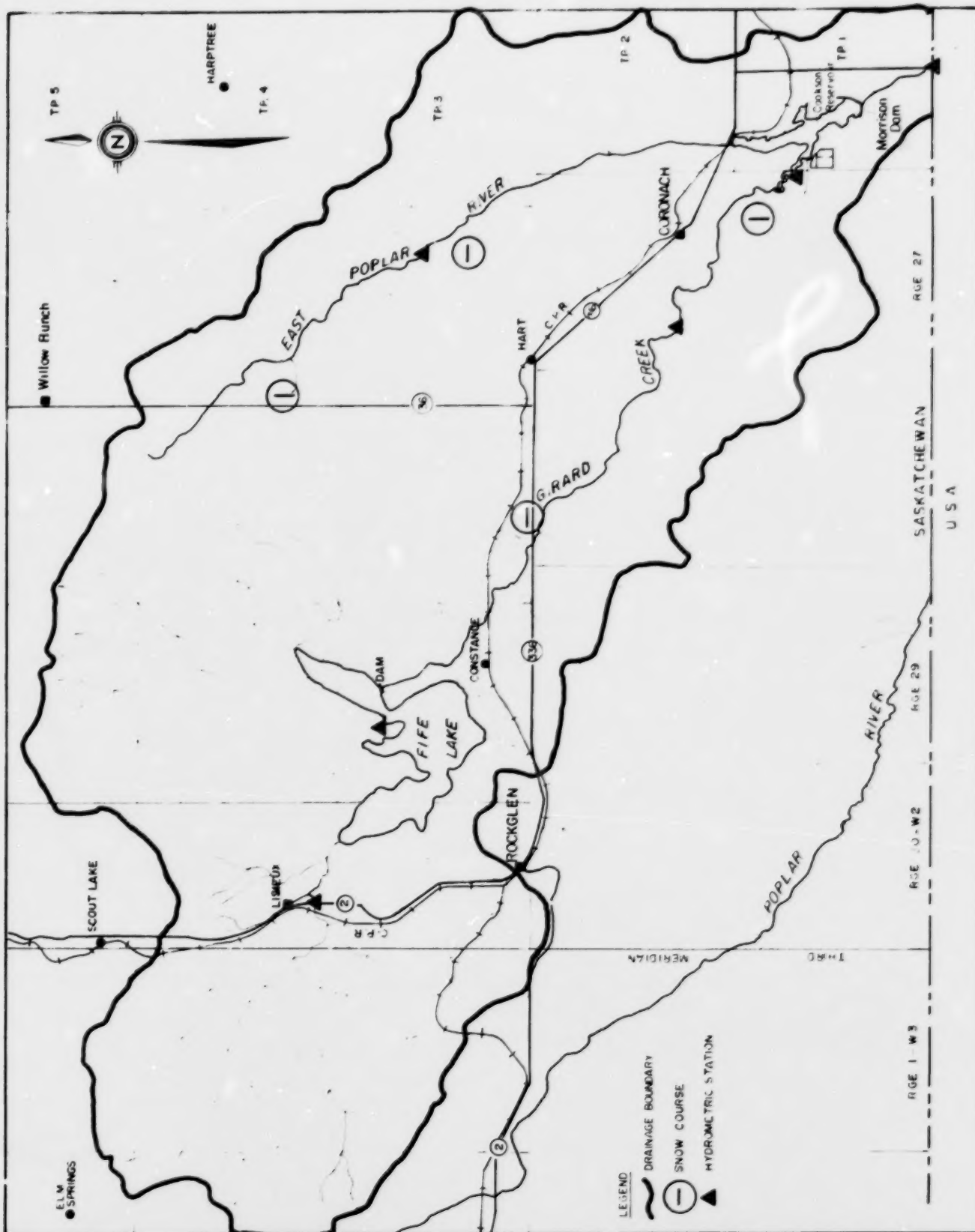
The 1981 to 1982 international commitment was calculated on the basis of March to May 1981 flow on the Middle Fork of the Poplar River. Data provided by USGS through Water Survey of Canada (WSC) indicated that the natural flow was 1 620 dam³. The interim apportionment formula states that the commitment to Montana on the East Poplar River when this volume of flow occurs in the Middle Fork is:

1. June 1, 1981 to August 31, 1981 - 0.028 m³/sec;
2. September 1, 1981 to May 31, 1982 - 0.028 m³/sec; and
3. Demand release of 370 dam³ at any time from June 1, 1981 to May 31, 1982.

Montana requested the 617 dam³ demand release for 1980 during the April 25 to May 19, 1981 period and the 1981 demand release of 370 dam³ during the June 1 to June 15, 1981 period. Both of these requests were met by releasing water from Cookson Reservoir.

Since flows from June 1 to December 31, 1981, were about 0.057 m³/s the apportionment flow conditions were met in 1981.

FIGURES



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Plan No. H2-5 (33)

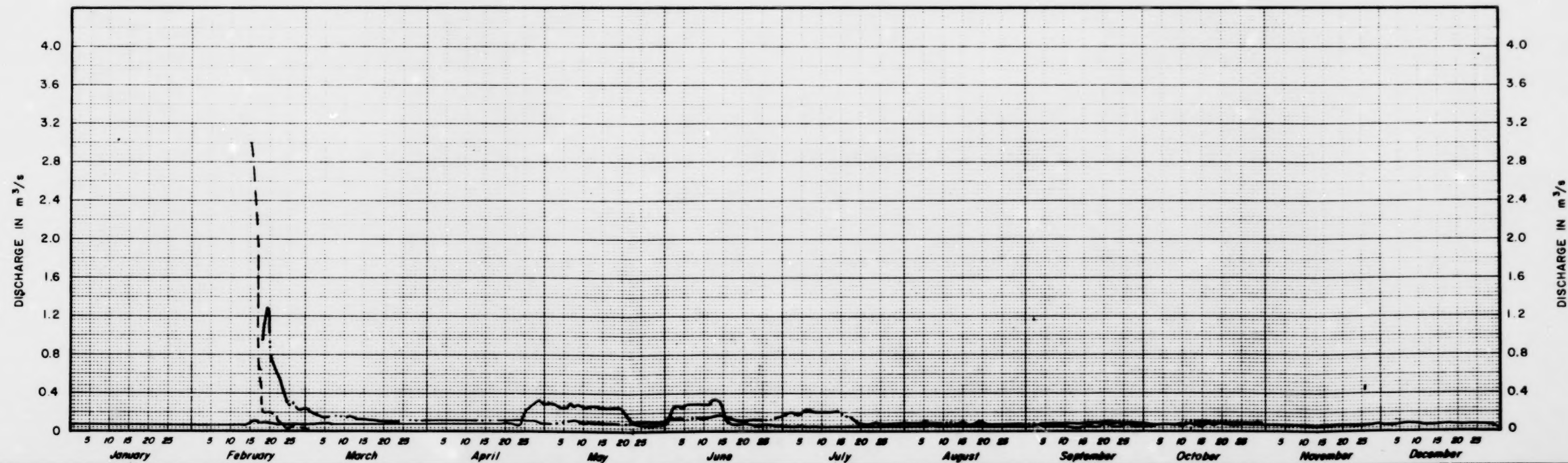
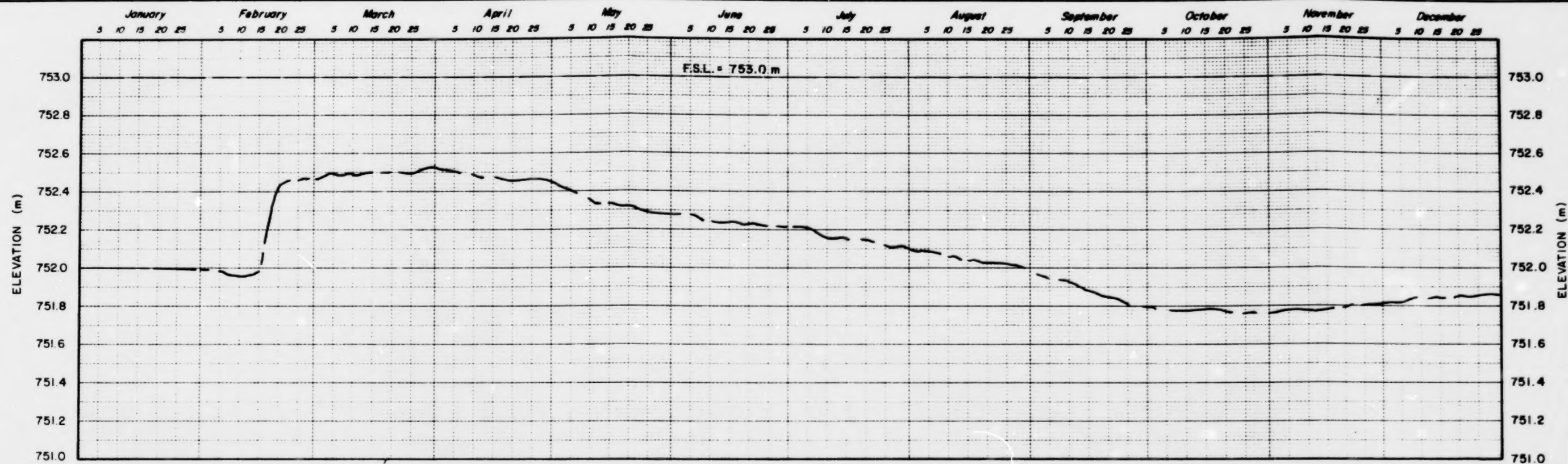
WATER MANAGEMENT ACTIVITIES
EAST POPLAR RIVER BASIN
1981

EAST POPLAR RIVER BASIN KEY MAP

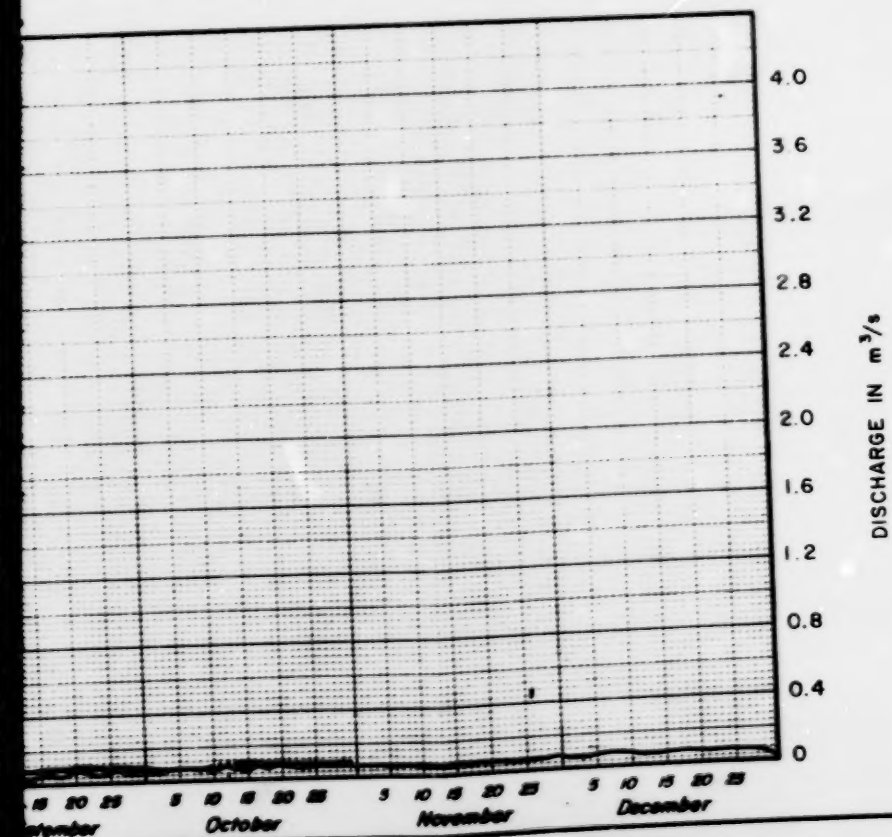
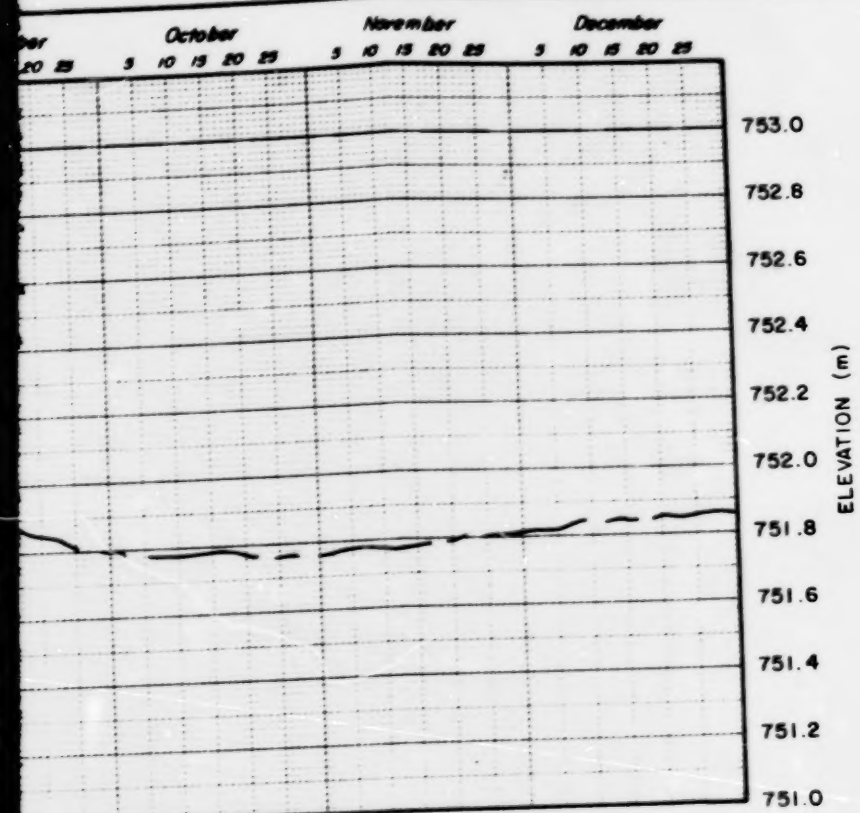
Figure

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LEGEND

- COOKSON RESERVOIR ELEVATION
- EAST POPLAR RIVER AT THE INTERNATIONAL BOUNDARY
- EAST POPLAR RIVER ABOVE COOKSON RESERVOIR
- GIRARD CREEK NEAR CORONACH

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WATER MANAGEMENT ACTIVITIES
EAST POPLAR RIVER BASIN-1981

1981 EAST POPLAR RIVER
GIRARD CREEK AND
COOKSON RESERVOIR HYDROGRAPHS

Drn. C.B.B.	Date JAN. /83	Figure 2
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APPENDIX A

INTERIM APPORTIONMENT IN THE

POPLAR RIVER BASIN

APPENDIX A

INTERIM APPORTIONMENT IN THE POPLAR RIVER BASIN

The following apportionment formula was recommended by the 1976 Poplar River Task Force^{1/} and has been tentatively adopted pending formal adoption of an apportionment formula:

The aggregate natural flow of all streams and tributaries in the Poplar River Basin crossing the International Boundary shall be divided equally between Canada and the United States subject to the following conditions:

1. The total natural flow of the West Fork Poplar River and all its tributaries crossing the International Boundary shall be divided equally between Canada and the United States but the flow at the International Boundary in each tributary shall not be depleted by more than 60 per cent of its natural flow.
2. The total natural flow of all remaining streams and tributaries in the Poplar River basin crossing the International Boundary shall be divided equally between Canada and the United States. Specific conditions of this division are as follows:

^{1/} The Poplar River Task Force was formed by the Souris-Red Rivers Engineering Board following a request by the International Joint Commission for a proposal for flow apportionment in the Poplar River basin.

- a) Canada shall deliver to the United States a minimum of 60 per cent of the natural flow of the Middle Fork Poplar River at the International Boundary, as determined below the confluence of Goose Creek and Middle Fork.
- b) the delivery of water from Canada to the United States on the East Poplar River shall be determined on or about the first day of June of each year as follows:
 - i) When the total natural flow of the Middle Fork Poplar River, as determined below the confluence of Goose Creek, during the immediately preceding March 1st to May 31st period does not exceed 4 690 cubic decametres (3,800 acre-feet), then a continuous minimum flow of 0.028 cubic metres per second (1.0 cubic feet per second) shall be delivered to the United States on the East Poplar River at the International Boundary throughout the succeeding 12 month period commencing June 1st. In addition a volume of 370 cubic decametres (300 acre-feet) shall be delivered to the United States upon demand at any time during the 12 month period commencing June 1st.
 - ii) When the total natural flow of the Middle Fork Poplar River, as determined below the confluence of

Goose Creek, during the immediately preceding March 1st to May 31st period is greater than 4 690 cubic decametres (3,800 acre-feet), but does not exceed 9 250 cubic decametres (7,500 acre-feet) then a continuous minimum flow of 0.057 cubic metres per second (2.0 cubic feet per second) shall be delivered to the United States on the East Poplar River at the International Boundary during the succeeding period June 1st through August 31st. A minimum delivery of 0.028 cubic metres per second (1.0 cubic feet per second) shall then be maintained from September 1st through to May 31st of the following year. In addition, a volume of 617 cubic decametres (500 acre-feet) shall be delivered to the United States upon demand at any time during the 12 month period commencing June 1st.

- iii) When the total natural flow of the Middle Fork Poplar River, as determined below the confluence of Goose Creek, during the immediately preceding March 1st to May 31st period is greater than 9 250 cubic decametres (7,500 acre-feet), but does not exceed 14 800 cubic decametres (12,000 acre-feet), then a continuous minimum flow of 0.085 cubic metres per second (3.0 cubic feet per second) shall be delivered to the United States on the East Poplar

River at the International Boundary during the succeeding period June 1st through August 31st. A minimum delivery of 0.057 cubic metres per second (2.0 cubic feet per second) shall then be maintained from September 1st through to May 31st of the following year. In addition, a volume of 617 cubic decametres (500 acre-feet) shall be delivered to the United States upon demand at any time during the 12 month period commencing June 1st.

- iv) When the total natural flow of the Middle Fork Poplar River, as determined below the confluence of Goose Creek, during the immediately preceding March 1st to May 31st period exceeds 14 800 cubic decametres (12,000 acre-feet) then a continuous minimum flow of 0.085 cubic metres per second (3.0 cubic feet per second) shall be delivered to the United States on the East Poplar River at the International boundary during the succeeding period June 1st through August 31st. A minimum delivery of 0.057 cubic metres per second (2.0 cubic feet per second) shall then be maintained from September 1st through to May 31st of the following year. In addition, a volume of 1 230 cubic decametres (1,000 acre-feet) shall be delivered to the United States upon demand at any time during the 12 month period commencing June 1st.

c) The natural flow at the International Boundary in each of the remaining individual tributaries shall not be depleted by more than 60 per cent of its natural flow.

3. The natural flow and division periods for apportionment purposes shall be determined, unless otherwise specified, for periods of time commensurate with the uses and requirements of both countries.

